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Treatment of Severe Atopic Dermatitis by Using Deep Seawater

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Seawater can be classified into two groups at a depth of 200 meters; surface seawater and deep seawater. Deep seawater contains more nutrients for plankton such as phosphates and nitrates but it contains plankton or bacteria when compared to the surface seawater. This fact allows us to store deep seawater for up to one month without any special treatment.

Atopic dermatitis is a chronic skin decease characterized by its allergic background of the patients and itchy eczematous skin. So far, several approaches, including antigen elimination, topical corticostreoid ointment, or anti-allergic drug administration, are applied for the treatment of children with severe atopic dermatitis. In some cases, these treatments still do not provide successful results dut to its adverse reactions or of the efficacy itself.

There is a report from National Children's Hospital in Tokyo, that seashore bathing was effective for the treatment of children with severe atopic dermatitis, which suggest us that seawater may contain something effective for the treatment of atopic skin. As seawater is not always available because it is hard to store for a long time, we designed a new protocol for the treatment of severe atopic dermatitis by

using deep seawater.

366 patients diagnosed with atopic dermatitis (age 0 to 63 y.o.) were treated for several months with the following protocol;

1. apply deep sea water directory to the eczematous skin for 5 minutes

2. wash and rinse out extensively with usual soap and water

3. use regular ointment

Regular ointment therapy was not changed before and after using deep seawater. Skin condition was assessed using an original symptom-area-severity scoring system before and every 4 weeks after treatment by doctors.

Deep seawater from a depth of 320 meters was pumped up and packed in plastic bottles and was provided from Kochi Artificial Upwelling Laboratory.

Each bottle was delivered every other week and stored in the refrigerator before use.

Results show,61 % of the patients was qualified "Eeffective", which reflect with over 5 points reduction of the symptom score; 36 % for "No change", with 0-4 points reduction, and 3 % for "Worth". No cases showed severe adverse reactions except slight irritation to the skin.

These data suggest that deep seawater might be a useful treatment for children with severe atopic dermatitis. The effect of deep seawater on immune system in vitro and double blind control study in vivo is under investigation.

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[illegible]

This study was supported by the grant from Office of Marine Product, Kochi Prefecture.

The Deepsea Water Oceanography Institute at Murotoat a rate of City, Kochi prefecture is to use in the study of the first of its kind in Japan. Ocean water 320 M below is pumped up 900 tons/day culturing of maritime creatures (original pictures supplied by courtesy of Maritime Science Technology Centre).

The Abstract of Hygen project of producing large quantities of hydrogen and possible fresh water if open cycle OTEC is used to produce the electricity used in the electrolysis process

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A method is presented for producing large quantities of hydrogen (H_2), and possibly drinking water, cheaply. It involves high temperature electrolysis performed with heat obtained from combustion, solar, nuclear fusion or other 'hot' sources and electricity acquired from 'colder' processes such as OTEC (ocean thermal energy conversion), or hydro-electric power generation.

The advantages of combining hydrocarbon combustion and OTEC with this process, for instance, would be:

- when hydrocarbon fuels are burnt in air, some 20 to 40% of their energy is lost to heat the inert gases in the air. These stack losses, which include the heat in the spent combustion gases, are eliminated by burning with co-produced oxygen (O_2). In this case, the combustion gases are mainly carbon dioxide (CO_2) and water vapor. They are initially so hot that they are ionized to an electrically conducting plasma. The electrolytic splitting of water vapor in this plasma is called 'plasmolysis'.

- About half the energy required for plasmolysis may be obtained from heat. This direct conversion of heat to H_2 is not subject to the Carnot constraint. Thus most of chemical energy in the fuel is converted to chemical energy in H_2 with the efficiency of the plasmolysis process - about 90%.

- Water splits into its component gases and ions more readily at high temperatures and low pressures. It is thus advantageous to release spent plasmolysis gases at low pressures - if possible below one atmosphere. The hot, thin, spent plasmolysis gases can be used to preheat fuels and O_2, and to increase OTEC yields before being released to condensation. If closed condensers are used, the condensate will be impure water containing dissolved acid rain gases, ash etc. It can be neutralized by adding limestone and used for irrigation. The remaining CO_2 can be compressed and released to the ocean where it remains liquid or semisolid (clathrate or hydrate). The ocean contains some 50 to 80 times more CO_2 than does the atmosphere so that releasing it there is relatively benign.

- The electricity required for plasmolysis can be obtained from an OTEC system. This is also converted to H_2 with the plasmolysis efficiency. Very large quantities of pure distilled water suitable for drinking can be obtained as a byproduct.

Though not all the above advantages would be available on land based Hygen devices for from the sea, benefits would still be substantial.

This 'Hygen' method of producing H_2 is essentially an innovative combination of well-proven hydrogen production technologies: electrolysis and the steam reforming of hydrocarbons. A process similar to MHD (magneto hydrodynamic) electricity production may be used to charge the plasma electrically, and 'magnetic bottle' techniques, similar to those which have been tested in thermonuclear fusion processes, to contain the charged plasma and to prevent the recombination of the O_2 and H_2 gases produced.

Latent heat recovery in the proposed OTEC process makes it possible to produce about six times more electric energy than is possible on conventional open cycle OTEC devices. OTEC energy yields are increased further by running cool and warm ocean water flows through syphons, using the energy of focused waves for pumping these flows, and by adding the residual heat of spent plasmolysis gases to that used for OTEC power generation. Wave energy is stored from stormier to calmer periods in simple, cheap reservoirs.

Costs are reduced substantially with new construction techniques - e.g. osmotically stiffened plastic cells are used to take up compressive forces in underwater pipes, wave lenses, buoyancy compartments and the like. Coupling OTEC turbines directly to homopolar generators which provide the plasmolyzers the high amperage, low voltage current they require, eliminates the alternators, transformers, rectifiers and busbars used in conventional electrolysis. Since this implies a short path between the electricity generators and plasmolyzers, it is envisaged that both processes will ultimately be combined on platforms floating out in tropical oceans. They can, however, be tested and used separately and on land. The Hygen process could be used, for example, to make cheap H_2 where electric power and fossil fuels are abundant.

The proposed technology facilitates the transition to the 'post petroleum age':

-contemporary automobiles have efficiencies of about 15 to 30%; efficiencies of steam power generation plants are about 30 to 40%. It is expected that heat will be converted to H_2 in plasmolyzers with an efficiency of about 90%. The OTEC process will probably contribute about as much electric energy as hydrocarbons or other heat sources provide heat energy. Fuel cells and aphodid engines running on H_2 have two to three times the efficiency of air breathing combustion engines. If these are used for transport and electric power production, some 2 to 6 times more useful energy (kWh electricity, km traveled) will be obtained from each unit of fuel. This is roughly doubled if the electric energy component is included.

- Hygen H_2 will be inexpensive. Little or no refining will be required of the fuels used. Electricity and heat are converted to H_2 directly. The process can start small and cheap with small devices which are used mainly to produce fresh water. Latent heat recovery, cold, then hotter electrolysis can be tested. Experience and profits obtained at each stage can help prepare for the next. Hygen H_2 will thus probably be very competitive with fossil fuels burnt in air - even if the enormous damage caused by their combustion and the benefits of co-produced fresh water and O_2, and other uses of Hygen - OTEC devices - food production, ocean bed mining, etc., are not taken into account.

- arid fossil fuel exporting countries would benefit from the large quantities of cheap fresh water co-produced with H_2. H_2 importers will benefit from less acid rain and oil spills, and fewer of the health problems associated with fossil fuels.

- existing fuel reserves can be used several times longer due to the higher production and utilization efficiencies of Hygen H_2. H_2 can also be used to fluidize and purify heavy and dirty petroleum, shale

oils, tar sands and the like.

- existing energy producing and distribution organizations and environmentalists will both benefit from an orderly, rapid transition to the H2 economy. There can be no more efficient ways of converting renewable energies - OTEC, wave, solar, wind, biomass - to H2 than by using them to boost Hygen yields. In most cases the equipment required to do this will also be substantially cheaper than when these renewable energy sources are exploited by themselves.

Hygen thus has the potential to be a very profitable technology which can be introduced in co-operation between existing energy interests and the generally perceived needs of the public to have cleaner, healthier, more environmentally friendly energy infrastructures.

Over the last century several proposals were made for producing large quantities of energy with little pollution:

- open cycle OTEC which would also produce much drinking water and help access the vast resources of the ocean,

- the MHD conversion of hydrocarbons to electric energy and,

- nuclear fusion which produces practically no wastes and can result in no meltdowns.

It is very probable that the promise of the first two will be realized with Hygen, and that this technology will advance the study of the last.

Profile of the Deep Sea Water Utilization Facility in Toyama Prefectural Fisheries Institute

BY
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Abstract - In 1995, the Deep Sea Water Utilization Facility was constructed in Toyama Prefectural Fisheries Research Institute, located on the coast of Toyama Bay on the Sea of Japan. The Facility blessed with three kind of distinctive water supply; surface seawater, underground freshwater and deep seawater. The facility pumps up 125 m^3 per hour of deep sea water from the depth of 321 m through a 3,063 m pipeline. The facility is provided with two high-pressure culture tanks with running deep seawater and a monitoring system. The pumped-up deep sea water is delivered into culture tanks directly, or after chilled to 0.5 ℃ by an electric chillier, or after heat-exchanged to higher temperature using surface seawater and underground freshwater.

The mean temperature of deep seawater pumped - up to the facility was 3.0℃ and its salinity was not show seasonal change.

We use deep seawater to promote the biological research and seed production of deep - sea organisms, to culture Masu salmon through the whole life cycle, to improve the seed production of shallow water species, and to apply for a variety of other non - fisheries purposes.

Introduction

The deep sea water (DSW) of Toyama Bay is stable, clean, cold and high nutrient - level water peculiar to the Sea of Japan. The main volume in Toyama Bay, joinsDSW of the Sea of Japan from geographical features. It is known that the condition of DSW is related to the movement of the warm Tsushima Current and that upwelling current of DSW influence the fisheries production in Toyama Bay. Recently, the DSW has been recognized as a natural resources.

In 1995, the Deep Sea Water Utilization Facility was constructed in Toyama Prefectural Fisheries Research Institute, Namerikawa, Toyama, Japan. It was located on the coast of Toyama Bay, the most accessible area to DSW along the coast of the Sea of Japan. The facility has three kind of water supply; surface sea water (SSW, seasonally fluctuating between 8 - 30°C), underground freshwater (UW, 18°C) and DSW. This supply makes it possible to promote the biological research and seed production of deep - sea organisms.

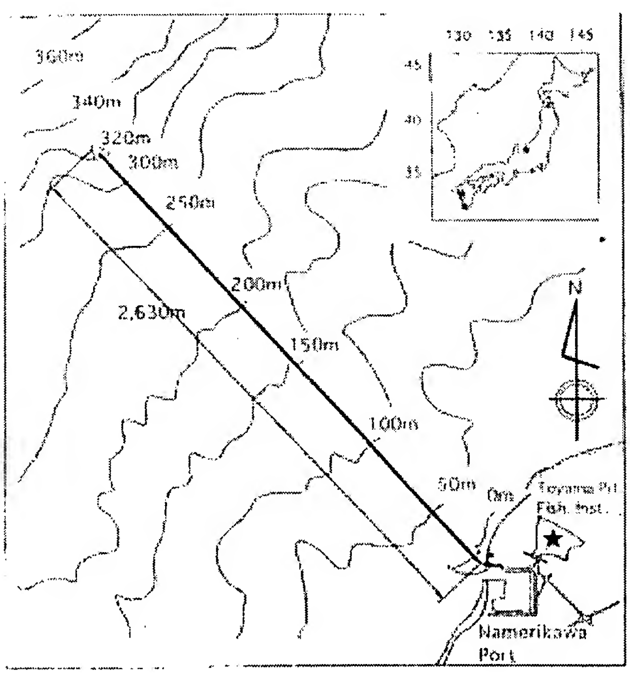

Fig. 1 Location of Deep Sea Water Intake Pipe and Toyama Pref. Fish.Res. Inst.

The following is a profile of the facility and the characteristics of pumped - up DSW.

Scale and ability of the facility

Figure 1 illustrates the location of Toyma Prefectural Fisheries Research Institute and DSW intake pipe. The facility pumps up 125 m3 per hour of DSW from the depth of 321 m through a 2,630 m seamless pipe on the sea bottom and 433 m on land. The specification of the facility are shown in Table 1.

Culture space of the facility, it covered 825 m^2, is sectioned into three areas; one in natural temperature and the others air - conditioned area. The room temperature under 10°C so as not to change the temperature of cultureis keep water for deep - sea organisms. The other area is controlled the to keep temperature under 20°C.

The pumped - up DSW is delivered into culture tanks directly, or after chilled to 0.5°C by an electric chillier, or after heat - exchanged to higher temperature using SSW and UW. The facility is provided with two high - pressure culture tanks, which could give pressure to 30 kg/cm^2 with running DSW. We could use them to experimental culture the deep - sea organisms under high pressure.

The water temperature, flow rates, dissolved oxygen, room temperature, and running condition of mechanism are monitored by monitoring system. Electricity receiving equipment of 150 kVA is placed.

Table 1 Specification of the Deep Sea Water Utilization Facility

Deep sea water system	
Total length of pipeline	3,063 m (2,630 m on sea bottom and 433 m on land)
Depth of intake	321 m
Amount of intake	125 m3 per hour
Suction pump	22 kW × 2
Underground water system	
Amount of intake	90 m3 per hour
Suction pump	11 kW × 2
Surface seawater system	
Depth of intake	15 m
Amount of intake	2 m3 per hour
Suction pump	0.4 kW × 2

The characteristics of deep sea water

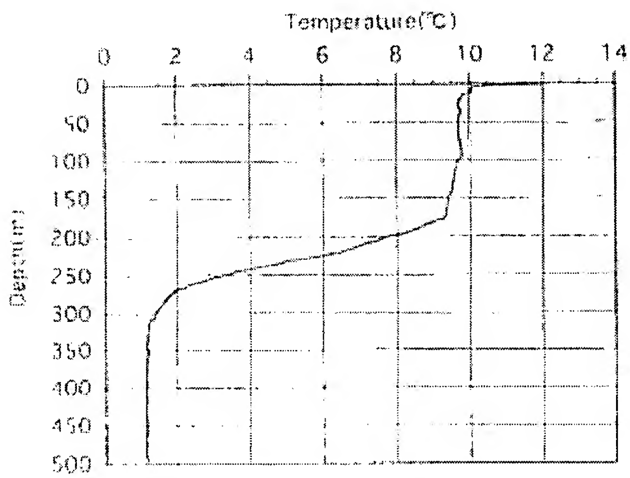

Fig. 2 Seawater temperature profile of Toyama Bay

1. Temperature

Figure 2 shows a typical sea water temperature profile of Toyama Bay. The deep seawater portion of this profile has very little seasonal change. The temperature of the water bellow 500 m in depth was constant and the range was less than 0.1℃. Figure 3 shows the temperature of every day DSW pumped - up to the Facility. The mean temperature of DSW,ranging from 2.8℃ to 5.9℃, through the year is 3.0℃. Seasonally change;were not significant,but sometime,rapd change within a few day was observed. The factors bring about the change is not known.

2. Salinity

It was stable and no seasonal change in salinity of the pumped - up deep seawater occurred as shown in figure 4. It ranged from 34.04 to 34.10. T- S diagram is shown in figure 5, the correlation between temperature and salinity was not observed.

The utilization of deep seawater

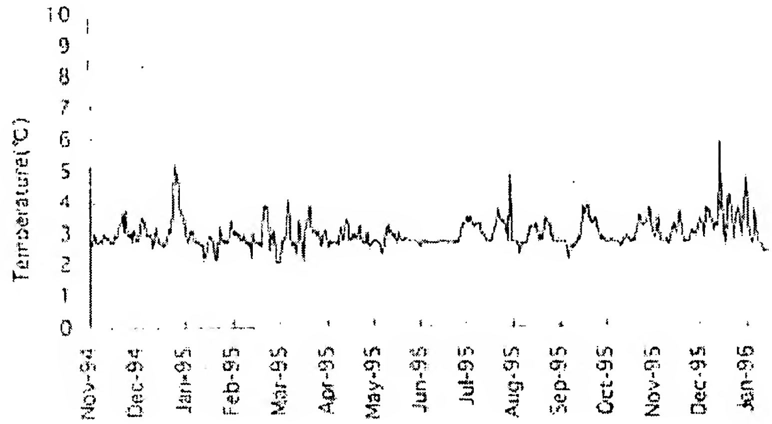

Fig. 3 Temperature of pumped-up Deep Sea Water

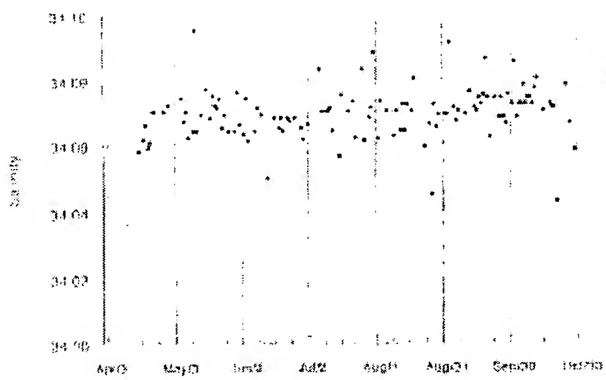

Fig. 4 Salinity change of pumped-up Deep Sea Water

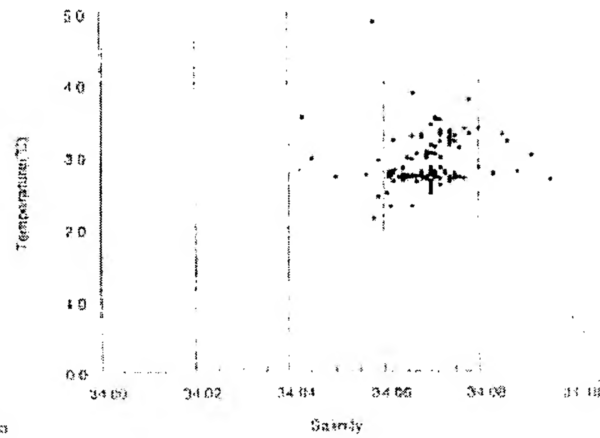

Fig. 5 T-S diagram of pumped-up Deep Sea Water

We use DSW not only to monitor itself to promote the biological research and seed production of marine organisms which live in deep - sea or low temperature.

One of main studies is seed production of Toyama shrimp Pandalus hypsonotus. We aim at to culture for at least one year, over 50,000 young shrimp to stock to Toyama Bay.

In the study of Masu salmon Onchorhyncus masou, the purpose is to culture Masu salmon in the same pond through the whole life cycle including freshwater and marine periods plus over 1,000,000 to propagate the natural population.

To manage natural resource, biological and ecological feature of red tanner crab Chinocetes japonicus, firefly squid Watasenia scintillans, and whelk Buccinum spp. were studied using DSW. In addition, studies on the culture technology of Kelp and micro algae are being carried out by taking advantage of DSW characteristics such as coldness, nutrients and cleanliness.

Not only deep - sea organisms, the DSW is used to improve the seed production of shallow water species, and to apply for food processing, fish transportation or a variety of other non-fisheries purposes.

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